CS3425: INTRODUCTION TO DATABASE SYSTEMS

Fall 2023

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Class Time and Location: See Canvas Home Page
Office Hour: See Canvas Home Page

Teaching Assistants: See Canvas Home Page

Topics

This course provides an introduction to database systems including database design, query, and programming. Topics include goals of database management; data definition; data models; data normalization; data retrieval and manipulation with relational algebra and SQL; data security and integrity; database and Web programming; and languages for representing semi-structured data. The main goal of this course is the teach students how to use databases to construct applications.

Learning Objectives

Upon successful completion of this course, students will be able to:

1. Design databases using ER diagram from a user specification
2. Analyze the problems of a given database design and normalize it
3. Create database objects such as tables, views, triggers, indexes, and stored procedures
4. Write complex SQL statements using multiple joins, aggregation functions and subqueries.
5. Identify the need of a transaction and use it appropriately
6. Design and implement a complete database application with Java and JDBC
7. Design and implement complete web applications with PHP, Html and Mysql
8. Grant and revoke permissions on database objects to users appropriately
9. Identify and correct SQL injection security vulnerabilities in code

Prerequisites:

CS2321 Data Structures and CS2321 Discrete Structures

Required Textbook:

A First Course in Database Systems, third edition, Jeffrey D. Ullman, Jennifer Widom

Class attendance and participation

Participation is crucial to your success in this course. Each student is expected to attend the class and participate in the class discussion. You are expected to write notes during the class time and work with other students in small groups sometimes.

Grading Weight:

- Attendance: 3%
- Assignments: 33%
- Lab reports: 14%
- Midterm Quiz: 8%

- Course project 42%
    - Phase1 22%
    - Phase2 and TA check: 20%

Grading Policy

Grading will be based approximately on the scale shown in the table below.

- A = 100-92%
- AB = 91-88%
- B = 87-80%
- BC = 79- 75%
- C = 74 – 70%
- CD = 69 – 65%
- D = 64 - 60%
- F = 59 – 0%

Late Policy

Students are expected to complete assignments before due date. In cases where students require additional time due to various reasons, late submission will be accepted up to 2 days after the original due date, with a penalty of 10% penalty for each late day.

Every assignment, including course project phase1 and lab reports, has a hard deadline for 2 days past the original due date. After the hard deadline, late submissions will not be accepted unless you have an approval letter from Dean of Students office.

Please note that late submission is NOT permitted for course project phase2.

Collaboration

Students are allowed to discuss ideas and concepts for homework and projects, but not allowed to copy answers from each other or from any other resources. Please refer the **Academic Integrity:** http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

Disabilities:

Please let me know if you have a disability that requires special arrangements. If you need extra time or special setting for exams, please request it at least 5 days before the exam date.

University Policies

Please see Academic Integrity, Assessment, Disability Services and other policies in https://www.mtu.edu/ctl/instructional-resources/syllabus/policies/index.html

Course Websites

Lecture notes, assignments, grades will be posted on the canvas system.

Course Schedule

This schedule is subject to change.

Wk#	Days of the Week	#	Topics	HW Assigned
W1	T	1	Introduction to Syllabus Introduction to Technologies/Software Introduction to DBMS (§1)	
W1	TH	2	Relational Model (§2.1, §2.2) Relational algebra (1/2) (§2.4)	
W2	T	3	Relational algebra (2/2) (§2.4)	Assignment 1
W2	TH	4	Entity/Relationship Model (1/2) (§4.1-4.4)	
W3	T	5	Lab 0: ER Design	Lab 0 report, Assignment 2
W3	TH	6	From ER to Relational Model (§4.5-4.6) Lab 0.5: ER to Relations	Lab 0.5 report
W4	T		Career Fair Recess. No Class	
W4	TH	7	ER Model Summary and Design Technique (§4.1-4.4) SQL (1) • Defining relation schema (§2.3) • Writing very simple queries (§6.1)	Assignment 3
W5	T	8	MySQL command line, FileZilla, I/O redirect Lab1 – Basic SQL	
W5	TH	9	SQL (2) • More on Basic SQL (§6.1) • Grouping and Aggregations (§6.2, §6.4) Set operations (Union, Intersection, Differences)	Lab1 report
W6	T	10	MySQL workbench SQL (3) • Subqueries (§6.3)	
W6	TH	11	SQL (4) • Work with nulls, case • More about Update and Delete (§6.5)	Assignment 4
W7	T	12	Assignment5 SQL (5) • Outer join • Complex Join Expressions (§6.3)	Assignment 5
W7	TH	13	SQL (6) • More data type and other misc. (§6.1.5) • View and Indexes (§8) • Constraints (§7.1-4) • Course project Phase1 Overview	Assignment 6

W8	T	14	Transactions (§ 6.6)	
W8	TH		Fall Break. No Class	
W9	T	15	PSM(§9.4) Triggers (§7.5) Privileges (§10.1)	
W9	TH	16	Course Project Q&A Lab 2 – PSM	Lab2 Report
W10	T	17	SQL Injection JDBC (§9.1, §9.2, §9.6)	
W10	TH	18	Midterm Review Course Project Q&A Lab 3 –JDBC	Lab3 Report
W10	TH (11/2)		Midterm Lock Down Browser Quiz open today in the testing center.	
W11	Monday (11/6)		Week 11 Monday 11:59pm: Course project Phase 1 Due	
W11	T	19	Unix Basics Web Server Basics	
W11	W (11/8)		Last day to take the Midterm Quiz in the testing center	
W11	TH	20	Web programming - client side: HTML (W3school HTML) Web programming – client side: CSS (W3school CSS)	
W12	T	21	Lab4 – HTML and PHP (Part1 and 2)	Lab4 report
W12	TH	22	Web programming – server side: PHP (§9.7, W3school Php) Lab4 – HTML and PHP (Part 3)	
W13	T	23	PHP and MySQL using PDO (§9.7, W3school Php) Lab5 – PHP and PDO Programming	
W13	TH	24	Web programming – client side: JS (W3school JS) SQLite (optional) Lab 6 – JS and SQLite	
W14	T	25	Design Theory: FD and Boyce-Codd Normal Form (§3)	
W14	TH	26	Introduction to NoSQL by Martin Fowler: https://www.youtube.com/watch?v=qI_g07C_Q5I Final Project Q&A	
Final Week	M,T (12/11-12/12)		**Project Demo: Monday or Tuesday**	
Final Week	Wed (12/13)		**Course project Phase 2 Report Due: Wed 11:59pm**	